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ABSTRACT

The Big Lake, Texas. microcomputer pilot project, begun in 1981 with the express purpose of assisting the slow learner with math, was expanded shortly after its inception to involve all 550 K-6 elementary school students, 56% of which were Spanish surnamed. Initially, teachers were not involved in the project; teacher aides were taught to operate the computers (one disc drive, five terminals, and one printer) and to assist the students. Each student was allocated 15 minutes per week using Millican math series software. Results of the Science Research Associates (SRA) scores at the end of 1 year showed a marked improvement in math and reading. During the first year, a presentation was developed and provided to over 300 teachers from 33 small schools to acquaint them with the microcomputer as an educational tool. Additionally, a computer camp was offered in 1982 for K-5 students to assist in evaluating computers as educational tools. There were problems in the project which were not overcome, i.e., limited machine locations and time per student, and a lack of a dedicated space for computer based instruction. Anticipated problems such as machine maintenance and teacher resistance to computerized instruction never occurred. (AH)

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1982

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In 1980, the authors explored the possibility of use of computers as educational tools in the small schools of West Texas. It was apparent that microcomputers were coming down in price to the point that the technology would be imposed on the schools if voluntary action on the part of professionals was not taken. What steps must educators take to meet this demand, and what were the likely consequences if they did not, were questions to be answered. History suggests that a technology will play a central role in the public schools if it gains cultural acceptance and becomes a common work tool. When the public makes the decision for the technology, there will be public demand for schools to adopt the technology and provide training in its use. Stanley Pogrow in the KAPPAN (May 1982, pp. 610-611) expresses the authors' belief that the U.S. is experiencing economic changes today that have not been paralleled since the industrial revolution when employment and production shifted from the farms and homes to the factory. Dr. Pogrow further states that as economic pragmatism fuels the adoption of new production of new technology, the cumulative impact will be to alter the nature of work. Routine work of today will be replaced by more technical work of performing logical and creative operations with electronic technology. The youngsters now in the elementary schools will be painfully aware of this switch. Because work is becoming increasingly technical, those students

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acquiring minimal competencies run the risk of being functionally illiterate and unemployable in 1990.

The elementary school in Big Lake, Texas was the institution for the pilot program chosen because of the principal and his desire to experiment with the microcomputer in elementary school as a teaching tool and for literacy's sake. The school is the elementary school serving Reagan County, which is somewhat isolated being located some sixty miles from the nearest urban shopping center. The elementary program serves approximately 550 children in grades K-6. It was decided that the first computers would be used as tools for those students who needed special help in arithmetic, and who were not under the tutelage of the Special Education teachers. Teachers were not involved at first for several reasons. They had a teaching load already and there was some anxiety about the new technology. Instead, teacher aides were taught by the principal to operate the computers and allow some sixty youngsters to work at five stations. The stations were created with one disc drive and five CPU units with one printer. Each child had fifteen minutes each week using the Millican math series which kept cumulative records. The Millican program was chosen because it is arranged by level of difficulty in addition, subtraction, and other arithmetic operations. Each student selects a level and solves the problems. The program is linear so that the student moves to a higher level of difficulty upon successful achievement of the beginning level.

If the student misses an answer three times, the answer is presented before moving to another problem. The software is designed

to show cumulative scores to teacher and parent at the end of each session. Results of the progress of this group of students was apparent in Science Research Associates (SRA) scores at the end of the year. No statistical methods were necessary to see the obvious improvement in math scores from 1981 and 1982.

SRA SCORES
GRADE EQUIVALENTS IN YEARS - MONTHS

Year	Class			
1981	First Grade	Math	1 year	2 months
		Reading	1 year	4 months
1982	Same class in Second Grade	Math	3 years	0 months
		Reading	2 years	5 months
1981	Second Grade	Math	2 years	6 months
		Reading	2 years	2 months
1982	Same class in Third Grade	Math	4 years	7 months
		Reading	3 years	9 months

It is to be noted that these grades enrolled 52% Hispanic surnamed students.

The success is best described in author Burleson's words at that time: "The day our computer was installed, we were in the middle of In-Service Training for the faculty. The confusion was incredible. However, within three days everything was installed, people were trained and operations had begun to educate our children in mathematics with the Educational System.

"My original reason for buying the computer was to educate the

slow-learners, to give them a little 'help' with a subject that was difficult for them. The plan was to give each student individual time alone with the computer. We set up the main disk drive in the library and had five terminals operating from it.

"We were a little apprehensive the first day. All the typical questions went through our minds. How would the students relate to the machine? Would it be more confusing for them rather than the conventional methods? Would it cause them undue frustrations?

"My fears were soon laid to rest. The children loved the computers and accepted the challenges as they were presented on the screen with enthusiasm. Something I hadn't seen in a long time.

"A short time later, I decided that if this was working so well with slow learners, why not introduce it to the entire student body? We set up a system whereby each student had fifteen minutes a week on the computer. Fifteen minutes didn't sound like much time to me, but the way the educational program is set up, the students were moving right along at a steady pace. But the unique part about it was that each child moved at his own rate and the computer automatically advanced him or kept him where he was until he was ready to move on.

"Life with the computer was not all work, either. We set up Friday as 'Fun Day'. The students were then allowed to select their own subject (addition, subtraction, multiplication or division) and then try any level they wished to attempt. Though the day's math work was all in 'fun', the children were constantly being exposed to the learning techniques, picking up

needed information at all times.

"The computer let the students know what level they were operating in (Kindergarten thru sixth grade) and personalized their input with messages on the screen that delighted them. "Good work, Tim", "Try one more time, Sarah", or "Congratulations, you can go on to the next level", were just a few of the added attractions of the computer. The children were working on a one-to-one basis with the computer and were not at all afraid of it.

"In addition, we have introduced Classroom Management to our instructors on a voluntary basis. This will allow a teacher to keep individualized records on each student as to the educational objectives she has planned. I feel this will be a definite advantage for us in the area of the Texas Assessment of Basic Skills (TABS) test required by state law. Basically, we set up the objectives on the computer so that each child should have them mastered by the time he is required to take the TABS test.

"I understand that Reagan County Elementary was a 'Pilot Project' for the computer instruction. The project couldn't have pleased me more. I knew the students were improving in the area of mathematics overall, but didn't know exactly how much until our yearly SRA test results were received. It was absolutely amazing. I honestly did not expect such fast results after such a short period of time on the computers. Every student in every grade showed a better overall grade improvement in math than they ever had in the past."

In 1981 and 1982, the authors' looked at the problem of teacher training. Since there were few programs to learn from, a

beginning was through in-service delivery. The authors' developed a presentation to teachers with machine demonstration showing the micro-computer as an educational tool. Nine elements made up the presentation:

1. An introduction to Computer Managed Instruction (CMI)
2. The computer as a classroom management tool
3. Information storage/retrieval via the computer
4. Simulation and model use
5. Classroom management uses of the computer
6. General programming skills
7. Application of CMI in the various disciplines (math, reading, physics, etc.)
8. Applications in computer science
9. Special educational application (use with handicapped, gifted, vocational, etc.)

Over three hundred teachers from thirty-three small schools participated in these presentations. The teachers tended to fall into three groups: those who pursued no further interest in CMI, those who had interest but refused to move further into professional development until their school district furnished computers for their classroom, and those teachers who wanted to develop computer skills immediately. For the latter group, further training was offered in workshops at Southwest Texas State University and other universities. Elementary teachers tended to have less anxiety about learning computer skills than secondary teachers did. For those teachers where follow-up workshops were possible, much time was spent on teacher use of the computer for periodic and repetitive subject matter in order to save teacher time for

affective classroom material. The teachers were also introduced to record keeping and general planning through computer operation. The fullest benefit of individual student diagnostic and prescriptive capabilities of CMI were not accomplished in the initial seminars but were introduced. Maintaining grade books and student profiles were especially appreciated by the teacher. Many of the teachers worked after school to learn computer skills, and peer teaching techniques were observed frequently as the teachers struggled together.

Two problems were apparent from the beginning and remain so to this day. The number of machine locations per student was and is limited. The number of computer locations need to be of such number that a student has a minimum of forty-five minutes/week hand-on time at the computer station. The other problem is dedicated space. The traditional elementary school has no appropriate space for computer based instruction. The library was used in this study but the need for security and teacher supervision was a problem. In construction of future schools, it might be kept in mind that a secure room similar to secondary school laboratories or business machines classrooms should be dedicated for CMI purposes. Interestingly, two problems anticipated to arise never did so. The maintenance of machines stayed within the ability of author Burleson to keep. In addition, the expected teacher resistance crumbled very early and even very experienced first grade teachers, noted for little interest in change, quickly took pride in their personal new learning achievements.

In reviewing the prospect after two years, there are several things we would do differently. First, we would determine the program desired and then purchase the tutorial software. At this point, the micro-computer which will support the software would be obtained. If you buy the micro-computer first, you are limited to the software designed for that CPU, and you may be denied useful programs due to hardware capabilities.

In the future, it is agreed that three curricular areas for tutorial purposes will be maintained: math, language arts and BASIC. The first two disciplines are for all students while BASIC will be for the gifted, talented, and highly motivated students. In 1982, the author started a programmer's course for ten of the most talented fifth graders. The programming development of these students has been nothing short of phenomenal and has them ready for much higher computer science work in high school.

The authors' felt that more information was necessary to evaluate the computers as educational tools with children of age K-5. Thus, in the summer of 1982, a computer camp was offered this age group through public solicitation. The camp was based on the fact that the mind and body must be developed together, and a full resident program of arts, craft, games, recreation and computer skills were developed through a week long activity. Fourteen students participated Sunday through Saturday at Harambe Oaks Ranch in Central Texas. Computers were rented from Reagan County schools and the authors served as instructors. The ranch provided the rest of the program. Each student chose two 30 minute work periods for the

computer each day and had the computer individually during this time. The curriculum was divided into tutorials (math and language arts), programming and games. Students were grouped by beginner, intermediate and advanced. Computers were available at night for each student to have time for individual follow-up to whatever suited the fancy. The students came with enthusiasm and excitement and were introduced to the computer and computer programming and all students learned to operate the computer and understood computer operation by the end of the camp. The youngest student at age eight did not do well with programming but developed many new skills in math and language arts. The top student who came with some knowledge of programming was able to write sophisticated programs for his personal use by day four. The authors used personally developed curricular material for teaching programming and used the six volumes of: Creative Programming for Young Minds published by Creative Programming, Inc. 604 6th Street, Charleston, Illinois 61920.

The computer camp will be offered again in the summer of 1983 to a limited number of elementary age students.

In closing, the authors' believe there are four reasons why computer education should be made available to school students, other than for just tutorial purposes:

1. "Don't look like a fool." The exponential proliferation of computers in our society mandates comfortable familiarity for everyone from bulldozer operators to ballet dancers--everyone, that is, who expects to practice his trade ten years from now.

2. "Principles of operation." Even a store clerk will be a better-paid store clerk with a course in the overall workings of computers under his belt.

3. "Decision making logic." Computers teach logic better than any non-interactive system like a textbook, and teach it in ways that often closely simulate the decision-making processes of managers.

4. "Computer-aided management." Computer competence (not necessarily programming--just user-competence) may one day become a prerequisite for anyone's move into management. Those who do move into management will understand what Oliver Wendell Holmes, Jr. meant when he said "Life is action and passion; therefore, it is required of a man that he should share the passion and action of his time at peril of being judged not to have lived."

"If a youngster graduates from high school with no particular skills and goes to a local corporation for a job, and if on the application he can claim ten hours experience at a computer terminal--and that's not much--it qualified for preferential positioning on the hiring scale.

Art Leuhrman, former head of the computer program at Lawrence Hall of Science in Berkely, CA. has stated that minimal programming skills--nothing fancy--translates into $1000 per year more in starting salary for a youngster going into almost any kind of job. Two 40-minute classes a week for a semester would probably more than do it. This project nearly reached that goal.